

Wide Area Precision Surveillance

NASA Integrated CNS Conference and Workshop

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Rannoch Background

- Established over 10 years
- Implements surveillance solutions
 - Government, commercial
- AirScene product used for airport management, including:
 - Airline operations
 - Air traffic control
 - Airport operations
 - Environmental mgmt
 - Security management

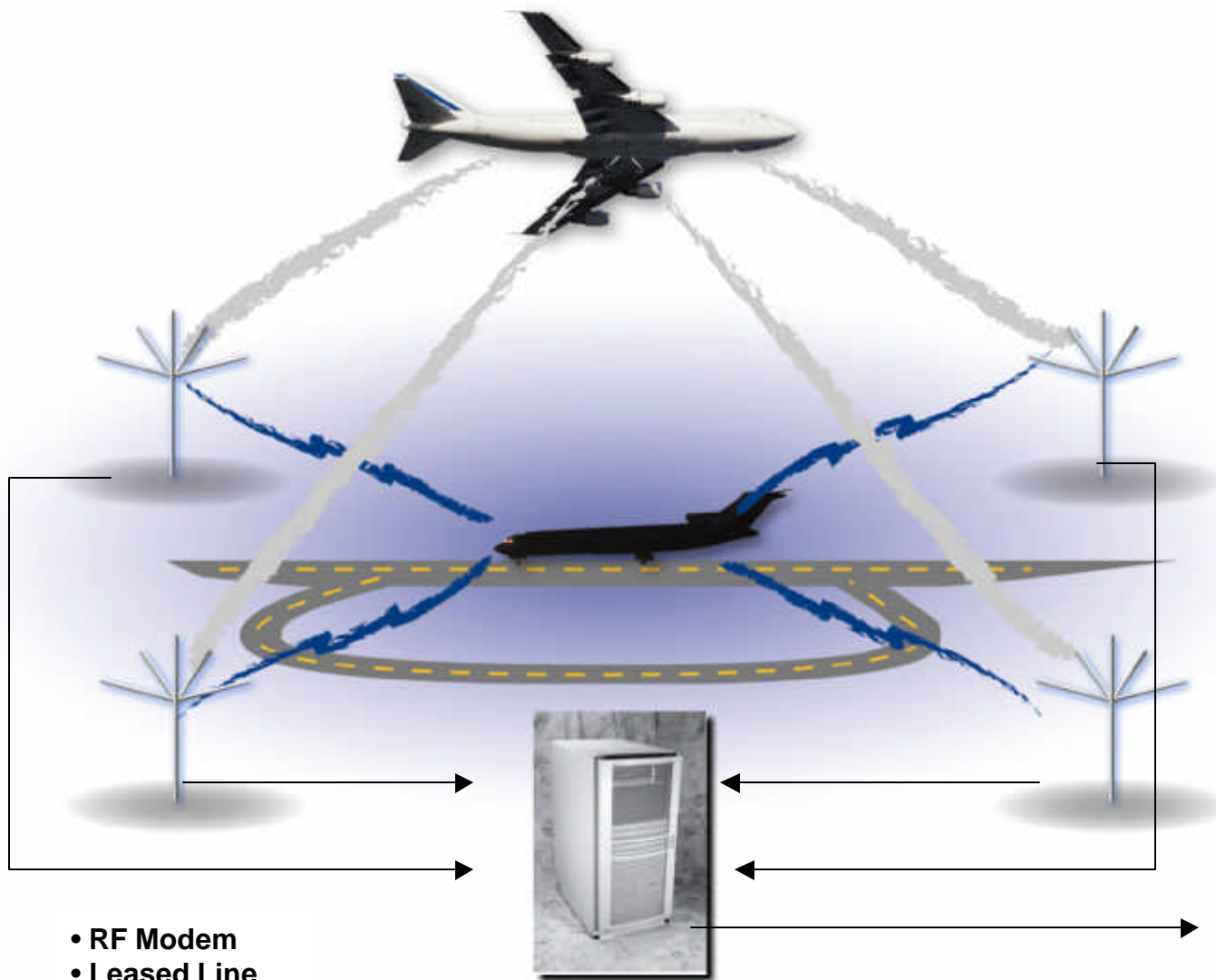


System Features

- Scalable Airport Management Solutions
- Modular Enterprise Software
- Integration of Management Activities
- Real-time Precise Tracking
- High Update Rate Surveillance
- Can be Independent of ATC Systems
- TIS Broadcast
 - 1090 MHz, VHF, Voice

Wide Area Challenges & Techniques

- Synchronization of Sensors
- Traffic Density
 - Sensor communication bandwidth
- Terrain/Topography
- Physical siting of sensors
- Traffic Mix
 - Mode A/C/S/ADS-B
- Active/passive techniques



- Passive or Active
- Independent of ATC
- Real time, 1 sec. Update
- Detailed aircraft info

- RF Modem
- Leased Line
- Dial-up Line
- Ethernet



System Features

- Passive or active
- Small compact Sensor Stations
- Separate receiver for mast mounting
- Satellite synchronization, siting flexibility and higher availability
- Wide area application
- Choice of communications available
- Sensors conduct self-survey



Compact Sensors






- Sensor controls
- Decode modes
- Remote monitoring
- Configuration and initialization
- Filtering
- Site Surveying
- Similar for interrogators

ARS Controls and Status

ARS 1

Controls:

Port: ARS Site Name: Phone Number: ☐ Direct Cable Connection 

Decoder Mode

☐ ATCRBS ☐ Mode S ☐ Both

Altitude Filter Bounds

Lower:

Upper:

ATCRBS Listening Window

Start Time:

Stop Time:

Threshold Value

Log Decoded Data to file

Status:

ARS Position And Time

Latitude: Time:

Longitude: Visible Sats:


Ellipsoid Height: Tracked Sats:


ARS Performance Parameters


Targ/Sec: Clock Drift: Q Usage (%):


Threshold: Dec/Sec: TOA Comp:

Sq Errors: Raw Data:

Overall GPS Status 

ARS Status Reporting 

Remote PLD Status 

Comm. Link Status 

Server Time:5057484 GPS Time reporting
Server Time:5046484 GPS Time reporting
Server Time:5044859 GPS position reporting
Server Time:5044718 Modem Connected @ 15087903567
Server Time:5007359 Connection disconnected.

Portable Systems



- Uses radio links for communications including digital cellular links



Central Server



- AirScene Server & Maintenance Display
- En Route Air Traffic Control Center
- Main Equipment Room
- Approach Control
- Hot Standby

Strathmore



Yarmouth



Turner Valley



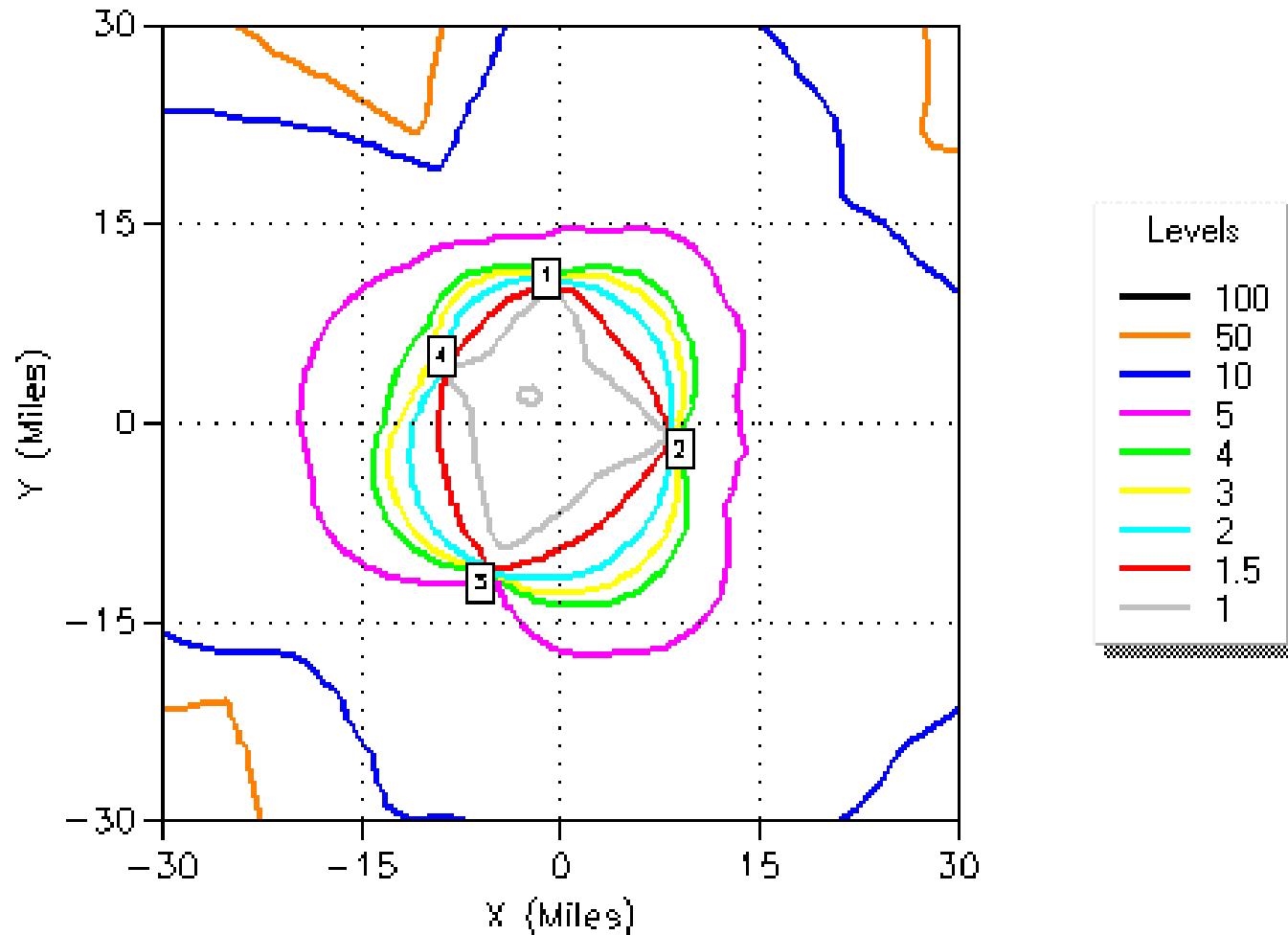
Comparison with Radar

- Several installed wide area systems – Japan, Canada, U.S.
- U.S. Volpe Center Developed Candidate Reqs
- Based on current specs for FAA's ATCBI-6 radar

Accuracy Element	Value
Range Jitter	+/- 7.5 M RMS
Range Bias	+/- 10 M
Azimuth Bias	+/- 0.033 deg
Azimuth Jitter	0.066 deg RMS

Sensor Geometry

Best of Triads

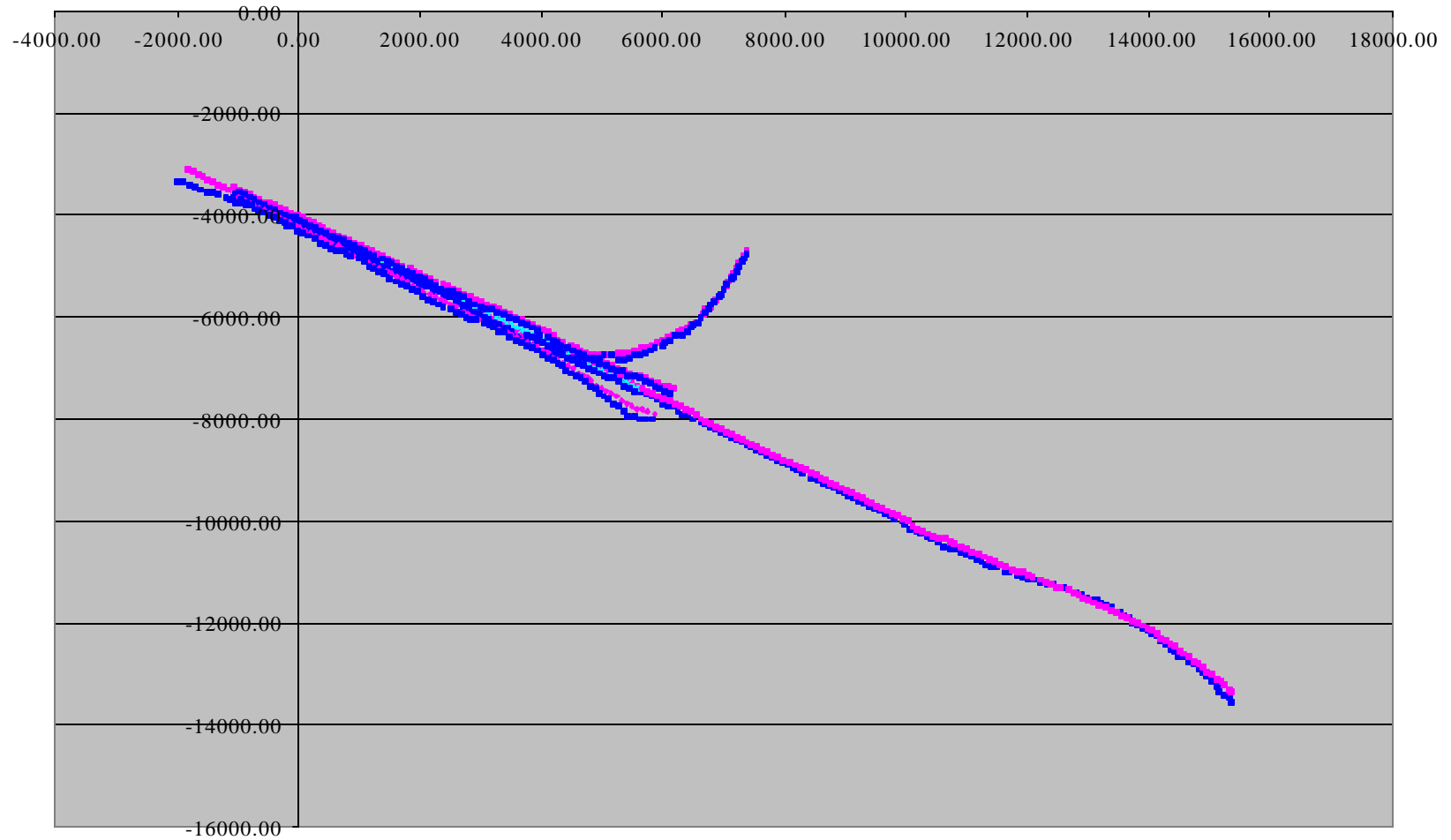


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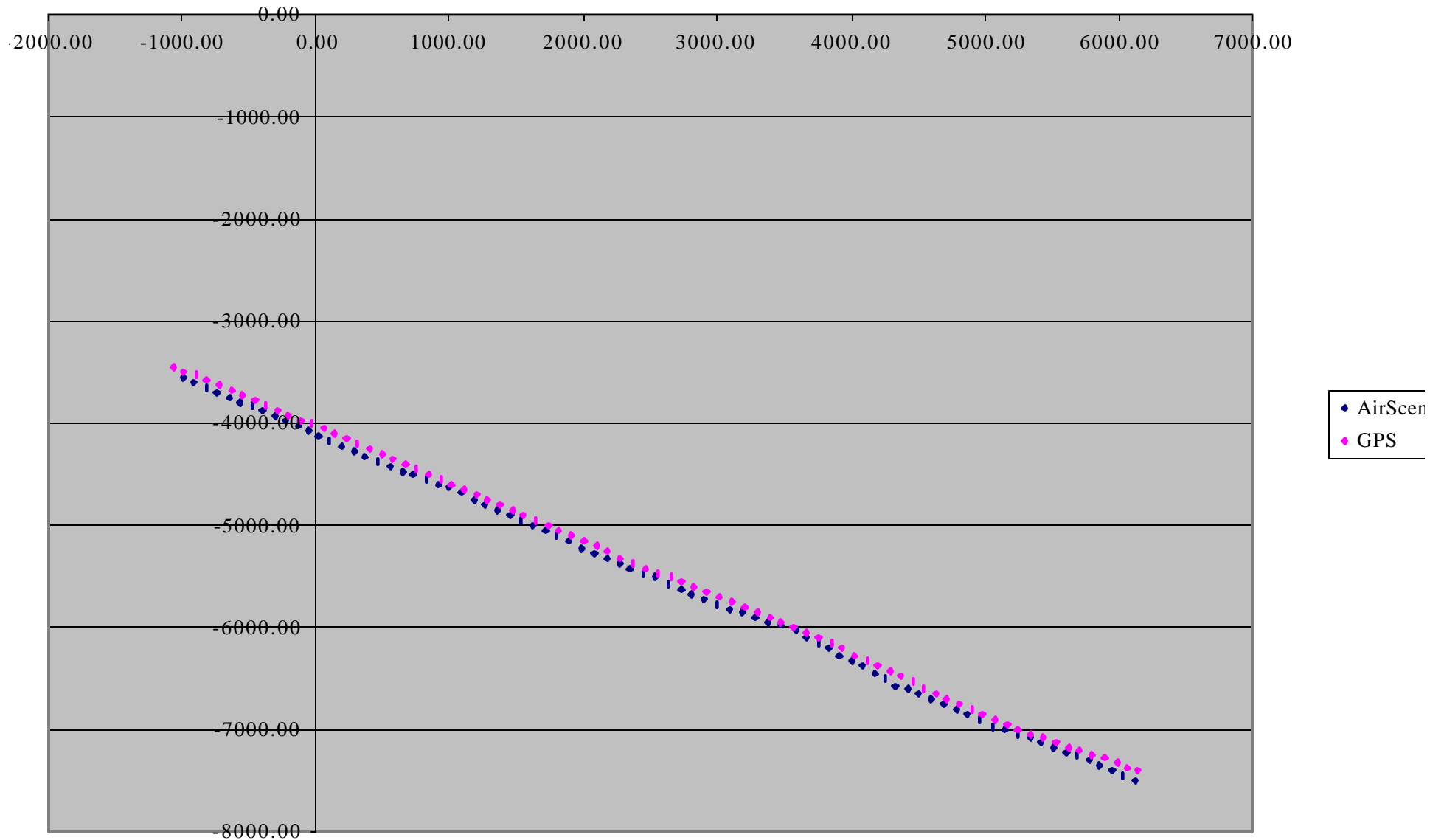
Flight Tests

- Jet and Turbo prop aircraft
- Mode A/C.S transponders
- Post Processed DGPS truth source
- Radar comparison, post processed
- Procedures
 - Radials, approaches, departures

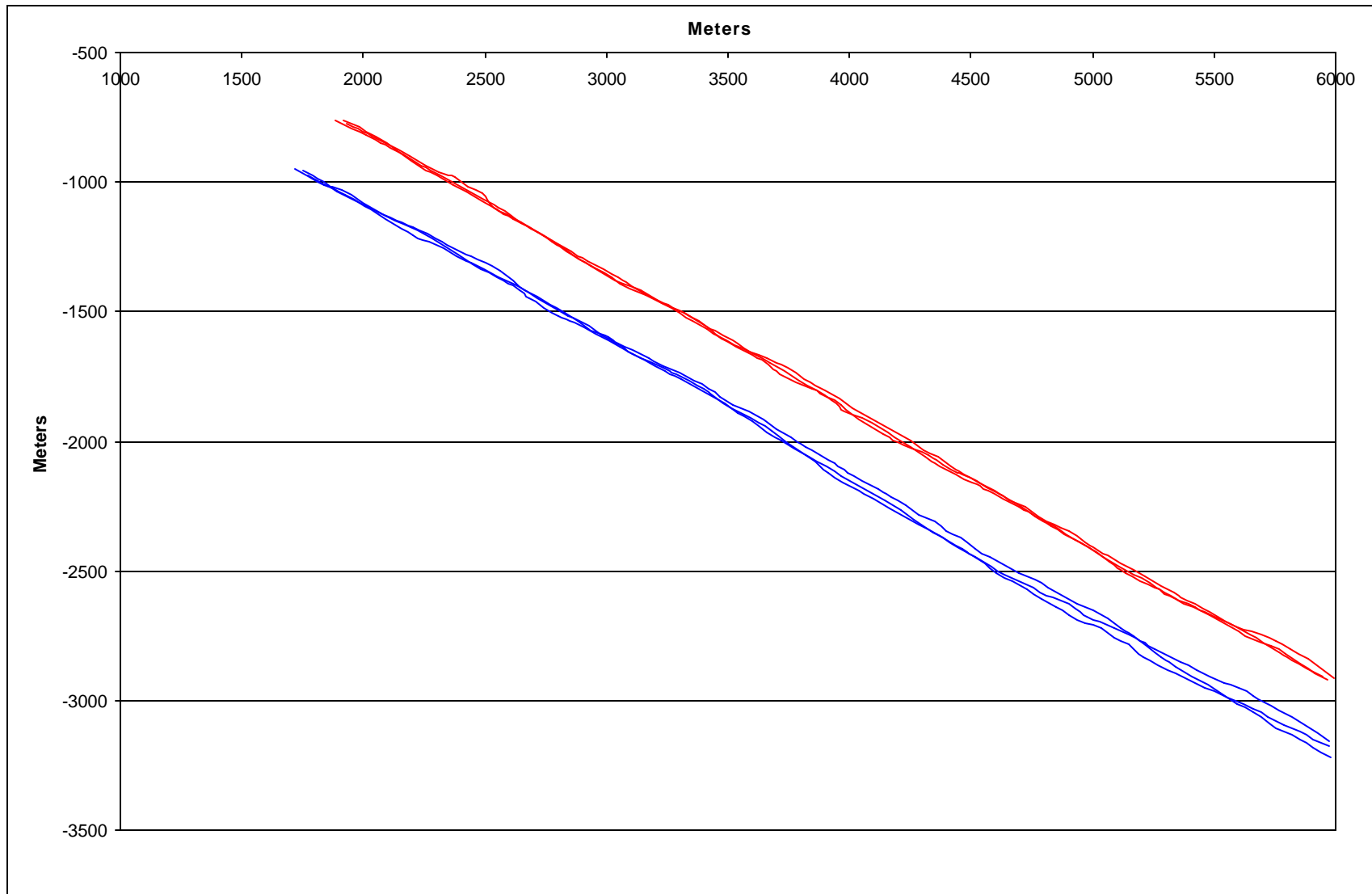
ILS Approaches

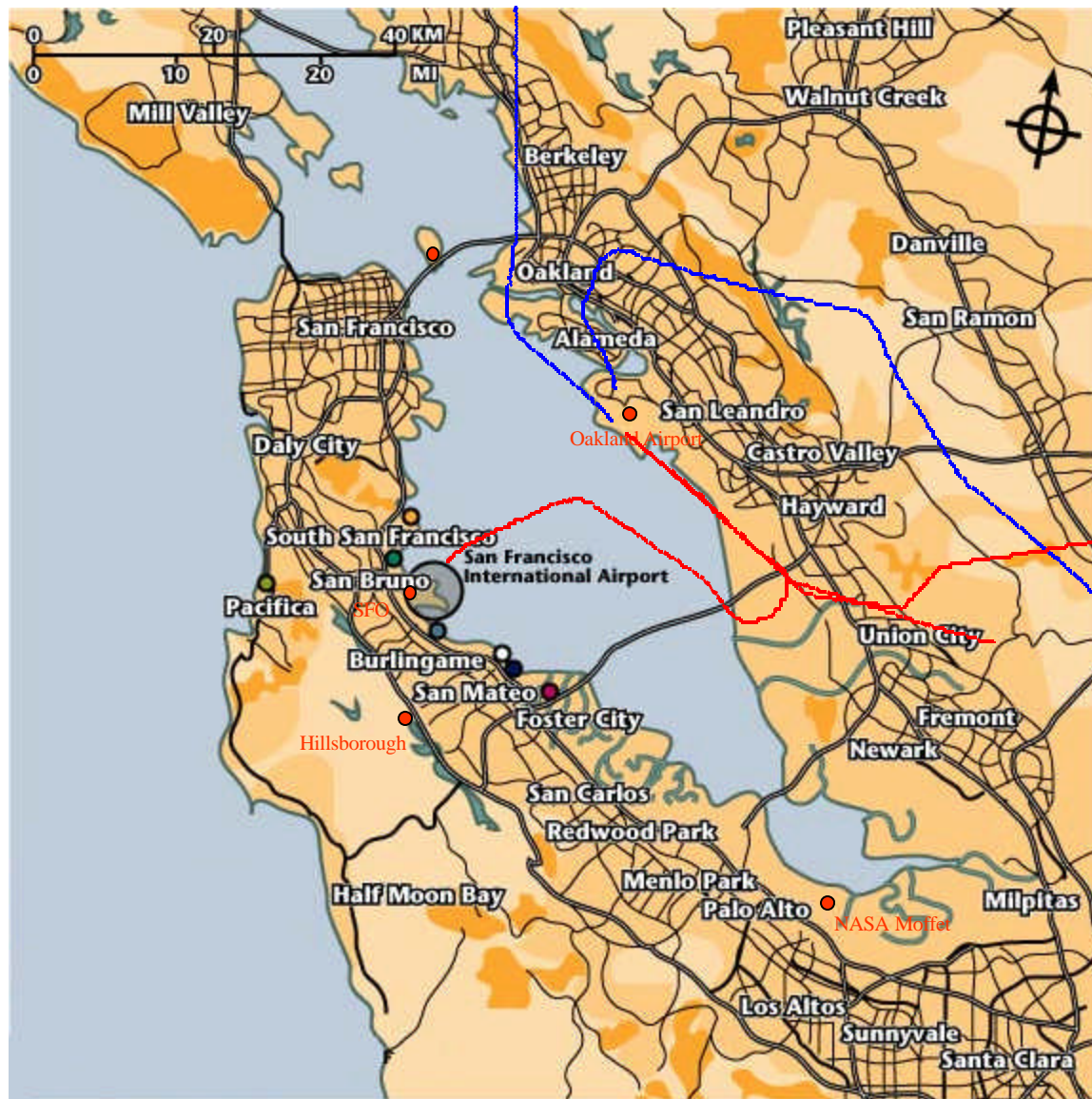


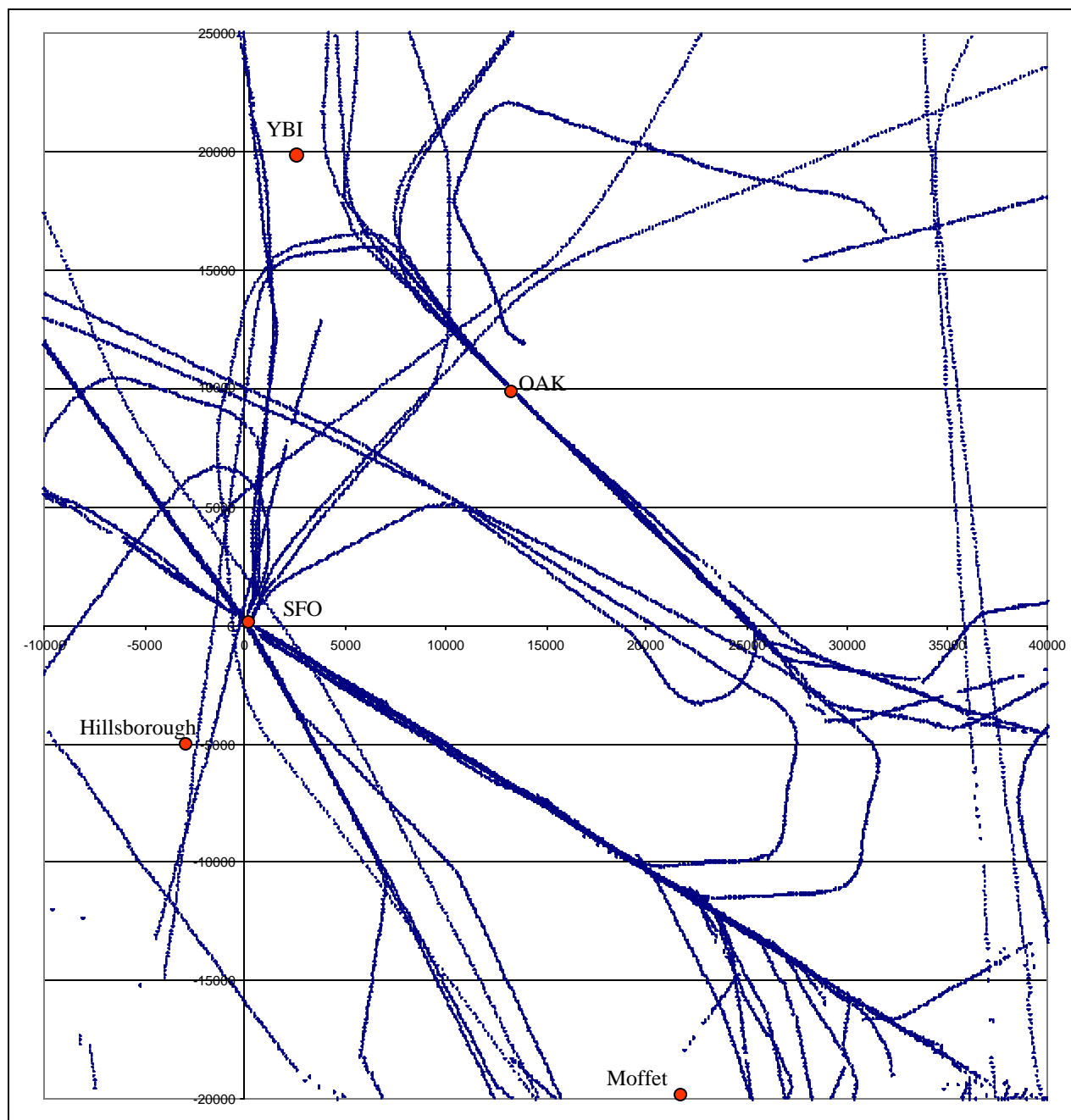
Approaches



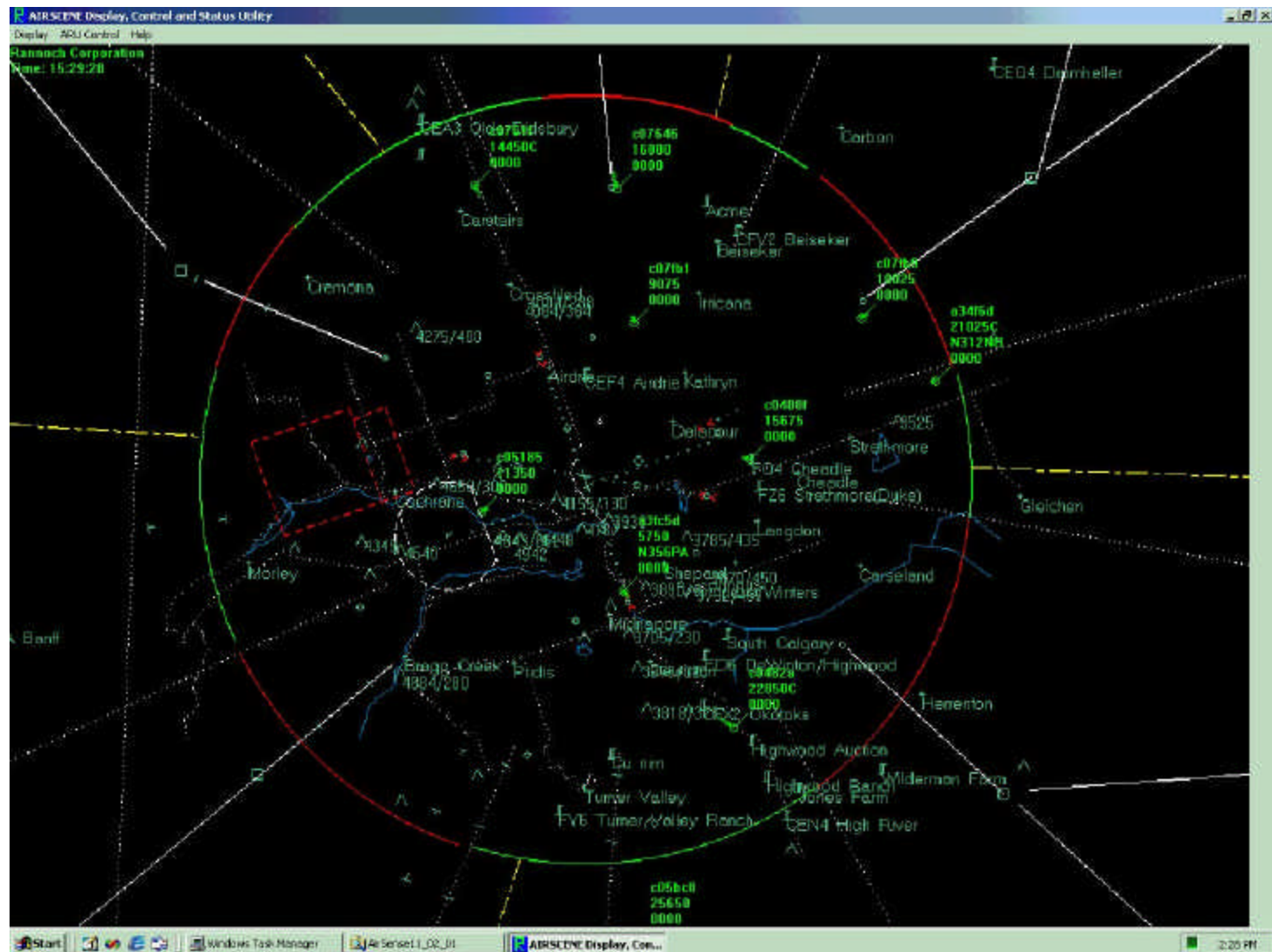
Closely Spaced Parallel Approaches



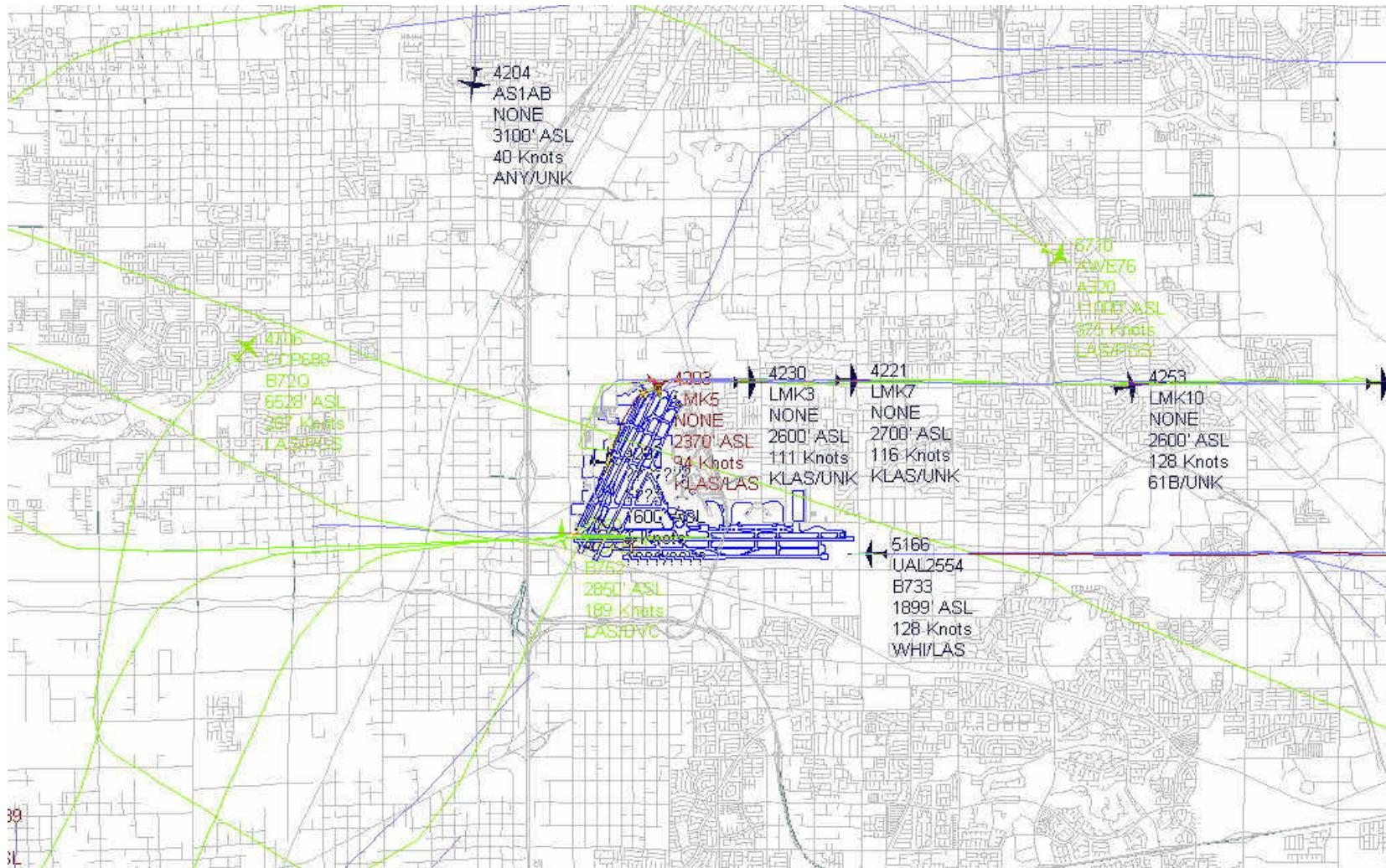




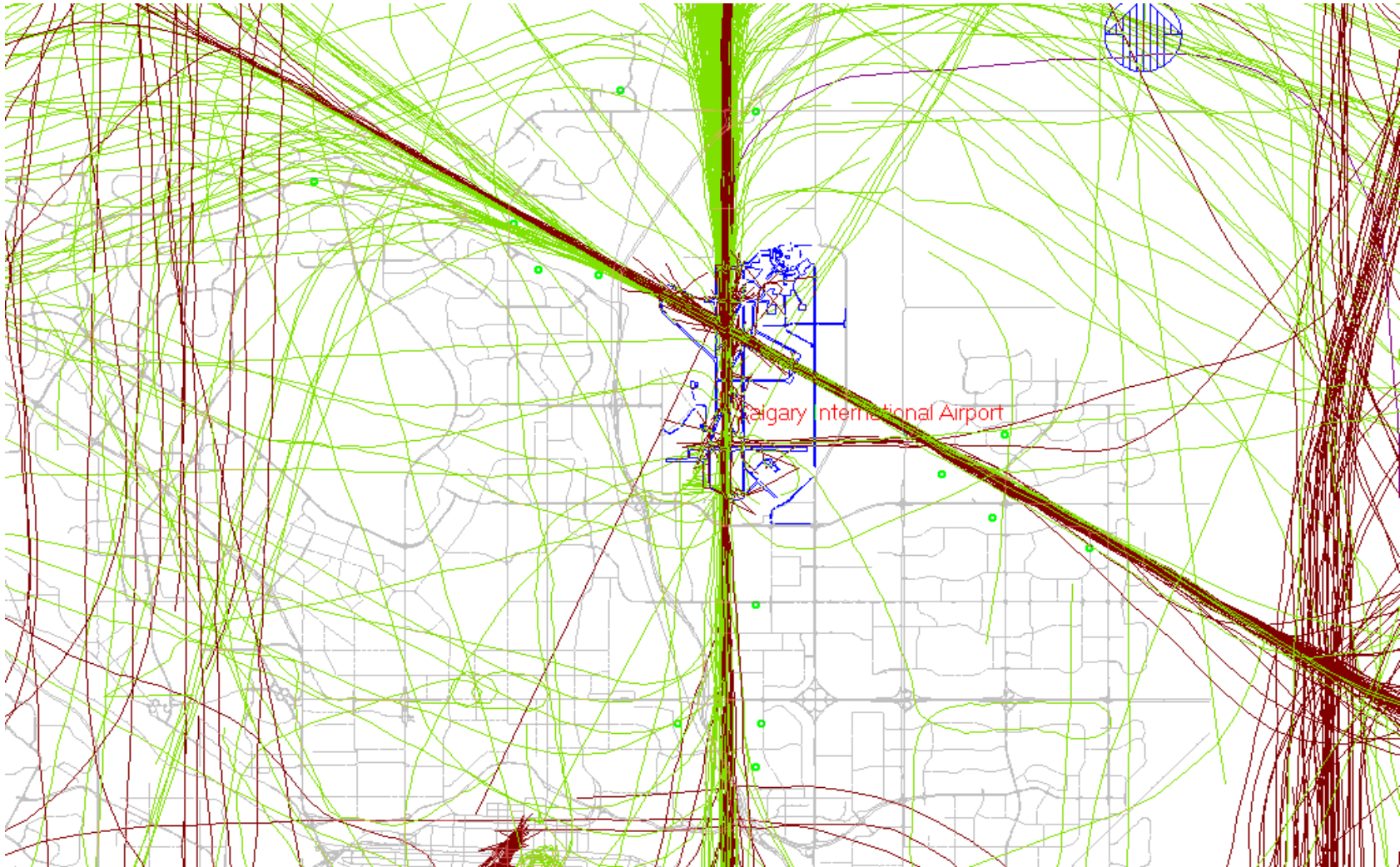
ATC Displays



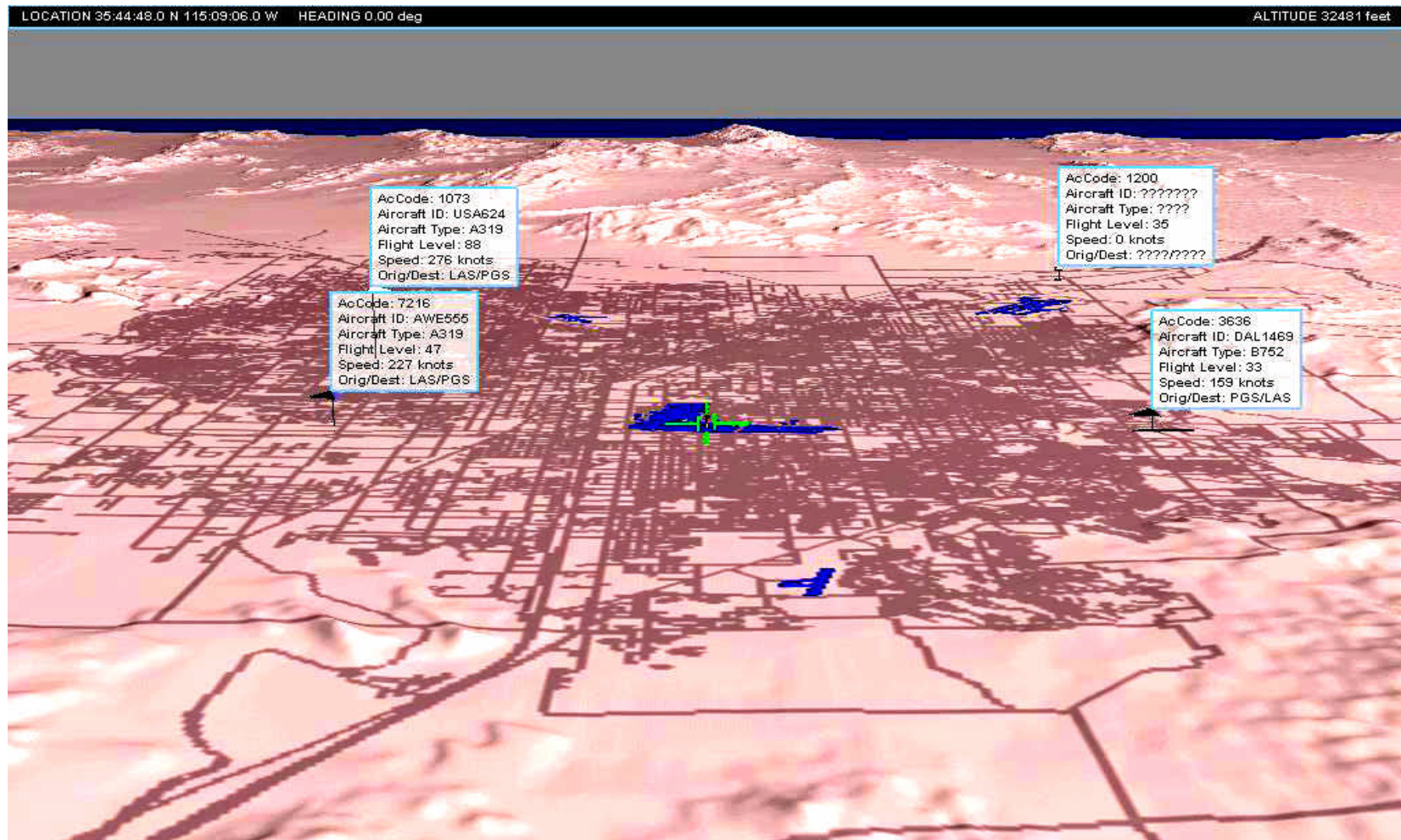
Flight Tracks – 2D View

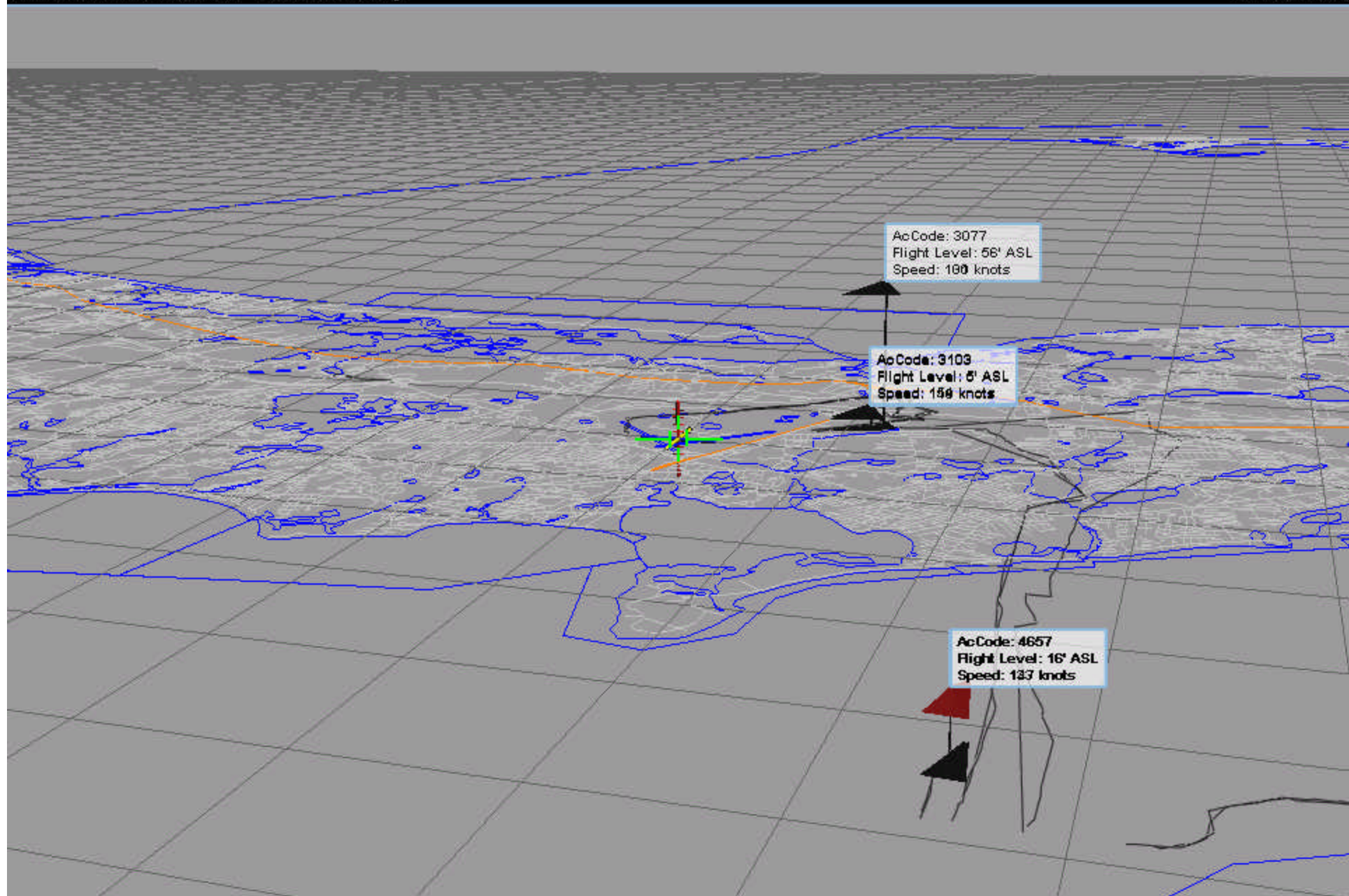


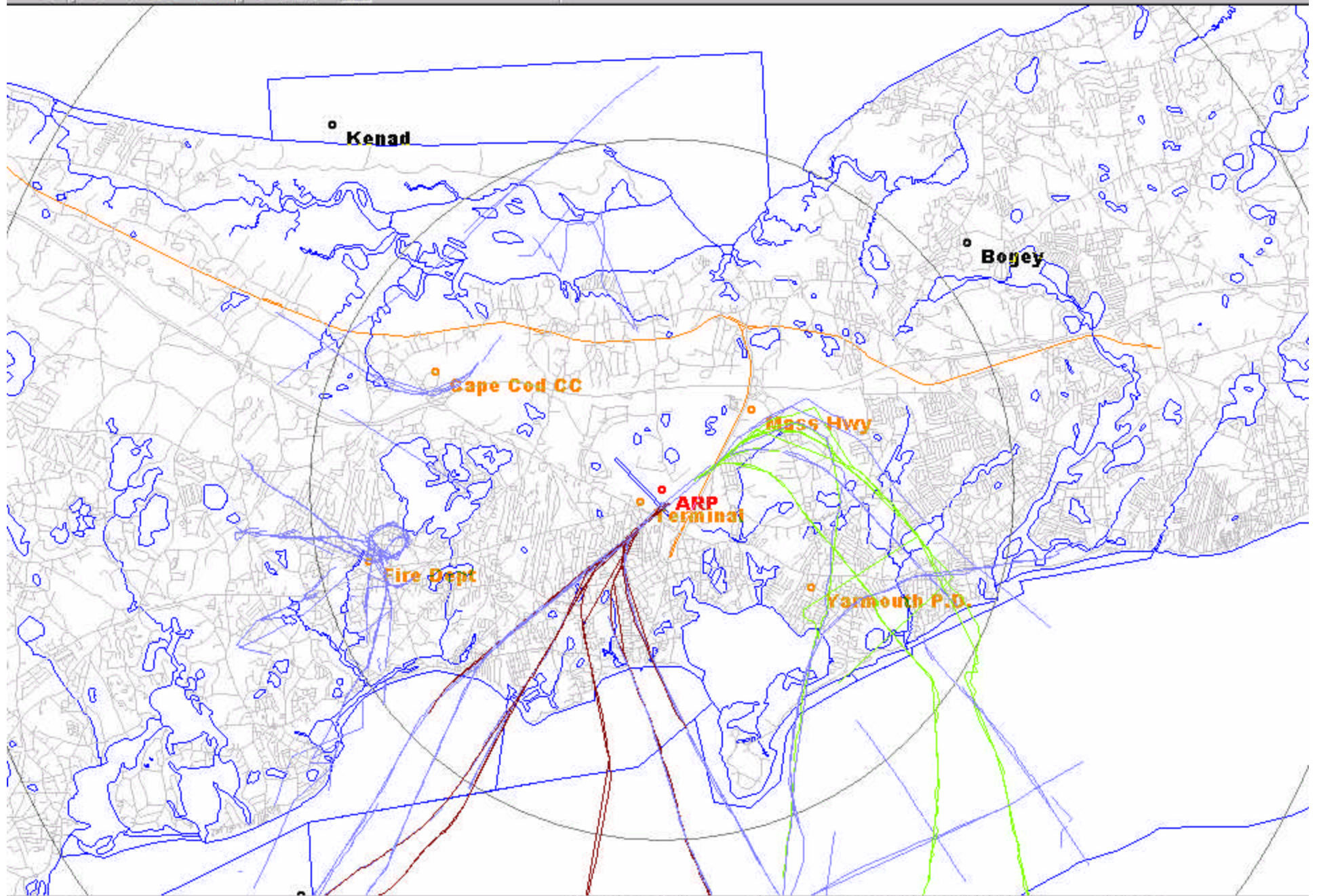
Traffic Replay



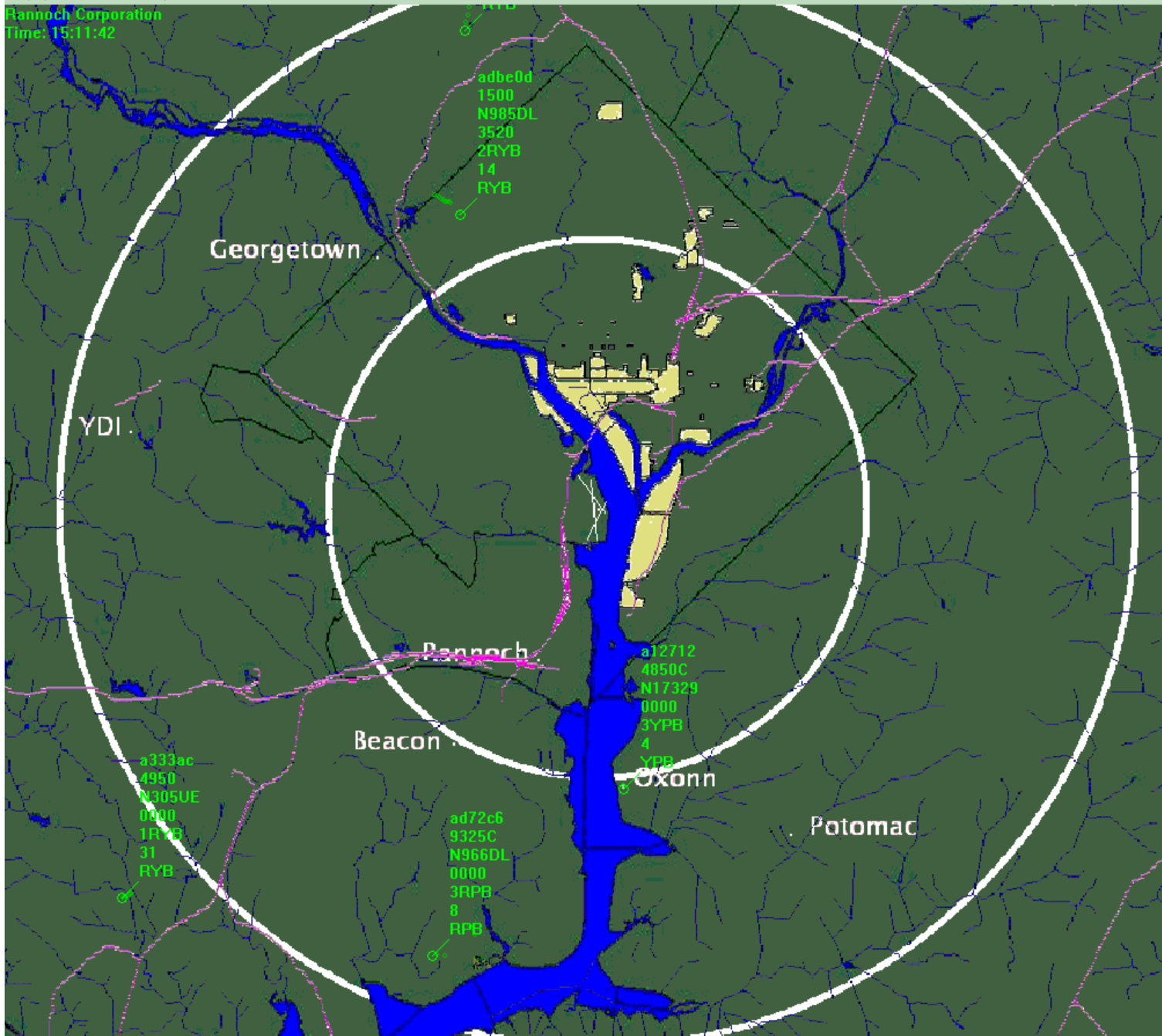
3D View With GIS/Terrain Data







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AirScene Multilateration For Non Movement Area/Ramp Surveillance

- ASDE-3 has limited coverage of non-movement areas
 - Crossing taxiways
 - Pushback identification and sequencing
- Coordination with FAA, Airlines, FAA, Airport Authorities, ARINC





Summary

- Wide Area Surveillance Feasible
- Satellite Synchronization
- Flight Trials
 - Radar Accuracy
 - High Update
- Variety of Applications
 - Airport Management
 - Air Traffic Control